

BIOLOGICAL ANIMAL SCIENCES

Curriculum Content Framework

**Please note: All assessment questions will
be taken from the knowledge portion of
these frameworks.**

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Curriculum Content Framework

BIOLOGICAL ANIMAL SCIENCES

Grade Levels: 10, 11, 12

Course Code:

Prerequisite: None

Course Description: This course is a scientific approach to animal science using scientific principles and applied management practices. An emphasis on selection and industry review involves scientific data gained through research and experimentation. Opportunities are provided for students to participate in FFA and supervised experience activities.

	Page
Unit 1: Biological Science in Our Lives (6 hours)	1
Unit 2: Safety in the Biological Animal Sciences (5 hours)	4
Unit 3: Conducting Experiments and Research (10 hours)	6
Unit 4: Summarizing and Reporting Research (8 hours)	9
Unit 5: Genetics and Heritability (9 hours)	11
Unit 6: Animal Reproduction (12 hours)	14
Unit 7: Digestion and Nutrition (10 hours)	18
Unit 8: Animal Health (12 hours)	22
Unit 9: Biological Engineering (8 hours)	26
Unit 10: Animal Product Food Preservation (10 hours)	28
Glossary	31

Unit 1: Biological Sciences in Our Lives

6 Hours

Terminology: animal science, biological science, zoology

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application		Skill Group	Skill	Description
1.1 Define terms	1.1.1		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6]
1.2 Discuss ways the biological animal sciences affect our everyday lives	1.2.1	Collect magazine and newspaper articles related to the biological animal sciences	Foundation	Reading	Adjusts reading strategy to purpose and type of reading (skimming and scanning) [1.3.1]
	1.2.2	Prepare a poster or bulletin board that depicts the biological animal sciences in our lives			Applies information and concepts derived from printed materials [1.3.3]
	1.2.3	Plan and/or carry out an experiment that involves an area of the biological animal sciences	Thinking	Creative Thinking	Draws conclusions from what is read [1.3.12] Uses imagination to create something new [4.1.1] Develops visual aids to create audience interest [4.1.4] Makes connections between seemingly unrelated ideas [4.1.6]
1.3 Describe career opportunities available in areas of the biological animal sciences	1.3.1	Research a career in the biological animal sciences to determine educational requirements, working conditions, and salary	Foundation	Writing	Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]
	1.3.2	Prepare a written report on a career in the biological animal sciences			Checks, edits, and revises document for correct information, appropriate emphasis, form, grammar, spelling, and punctuation [1.6.5]
	1.3.3	Provide an oral report on a career in the biological sciences	Personal Management	Career Awareness, Development and Mobility	Evaluates written information for appropriateness/content/clarity [1.6.9] Develops skills to locate, evaluate, and interpret career information [3.1.4] Explores career opportunities [3.1.6] Identifies continuing changes in male/female roles at home and work [3.1.7]

				Identifies education and training needed to achieve goals [3.1.8]
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1.4	Discuss FFA and supervised experience opportunities in the biological animal sciences	1.4.1	Use the Official FFA Manual, National FFA web site, and other resources to identify opportunities in the biological animal sciences	Foundation	Listening	Evaluates oral information/presentation [1.2.2]
		1.4.2	Plan and/or expand existing supervised experience to include the biological animal sciences	Personal Management	Speaking	<p>Listens for content [1.2.3]</p> <p>Listens for long-term contexts [1.2.7]</p> <p>Asks questions to clarify information [1.5.3]</p> <p>Asks questions to obtain information [1.5.4]</p> <p>Analyzes impact of work on individual and family life [3.1.1]</p> <p>Monitors progress toward goal attainment [3.1.10]</p> <p>Sets well-defined and realistic personal/career goals (short-term and long-term) [3.1.11]</p>

Unit 2: Safety in the Biological Animal Sciences

5 Hours

Terminology: animal restraint, laboratory accident, occupational safety, personal safety, safety, zoonotic disease

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.1 Define terms	2.1.1	Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		Thinking	Knowing How to Learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
2.2 Discuss the meaning and importance of safety and safe work in the biological animal sciences	2.2.1 Relate examples of safety hazards in the biological animal sciences	Foundation	Reading	Distinguishes between fact and opinion [1.3.11]
	2.2.2 Identify zoonotic diseases and the precautions to follow to minimize risk		Speaking	Asks questions to obtain information [1.5.4]
2.3 Identify hazards in the biological animal sciences	2.3.1 Identify hazardous situations in the biological animal sciences and implement appropriate safety measures to eliminate or reduce the risk of the hazards	Foundation	Reading	Analyzes and applies what has been read to specific task [1.3.2]
	2.3.2 Develop a list of animal restraint practices that reduce risk	Personal Management Skills	Integrity/ Honesty/ Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]
	2.3.3 Identify laboratory risks and take actions to minimize the hazards			
2.4 Describe the importance of personal safety in the biological animal sciences	2.4.1 Identify and properly use appropriate PPE, including protective clothing and safety footwear	Thinking Skills	Problem Solving	Comprehends ideas and concepts related to safety with animals [4.4.1]
	2.4.2 Calculate the cost of PPE for an individual involved in animal agriculture	Foundation	Arithmetic/ Mathematics	Calculates dollar amounts [1.1.7]

	2.4.3	Work together with others to promote safety in the biological animal sciences	Interpersonal	Negotiation	Works to resolve conflict between two or more individuals [2.5.3]
	2.4.4	Gain a satisfactory score on a biological animal sciences safety test			

Unit 3: Conducting Experiments and Research

10 Hours

Terminology: conclusion, control group, data, dependent variable, experiment, findings, hypothesis, independent variable, manipulation, procedure, recommendation, replication, research, treatment

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application		Skill Group	Skill	Description
3.1 Define terms associated with experimentation	3.1.1		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Thinking	Knowing How to Learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
3.2 Discuss procedures in conducting experimental research	3.2.1	Review reports of experimental research to identify the procedures followed	Foundation	Science	Applies/Uses scientific method [1.4.7]
	3.2.2	Plan an experiment that follows the procedures of experimental research			Describes/explains scientific principles related to research [1.4.14]
	3.2.3	Explain the meaning of hypothesis and hypothesis testing	Thinking	Reading	Identifies relevant details, facts, and specifications [1.3.16]
	3.2.4	Explain the use of a log book in experimentation		Problem Solving	Comprehends ideas and concepts related to scientific research [4.4.1] Draws conclusions from what is read and gives practical solutions [4.4.3]

3.3	Explain how the research process is applied to lab and field experiments	3.3.1	Conduct a simple experiment following approved methods	Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
		3.3.2	Observe safety practices in the conduct of experiments			Applies a scientific principle to solve a problem [1.4.8]
		3.3.3	Provide for the well-being of animals that are used in experiments	Interpersonal	Teamwork	Contributes to group with ideas, suggestions, and effort [2.6.2]
		3.3.4	Identify appropriate experiments that involve living animal subjects			Works effectively with others to reach a common goal [2.6.6]
				Personal Management	Integrity/ Honesty/ Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]
3.4	Discuss the collection of data	3.4.1	Identify appropriate measurements for an experiment			
		3.4.2	Collect and record data in a log book or appropriate computer program			
		3.4.3	Compile and analyze data to draw meaning from the experiment			

Unit 4: Summarizing and Reporting Research

8 Hours

Terminology: abstract, background, bibliography, conclusion, finding, procedure, recommendation

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application		Skill Group	Skill	Description
4.1 Define terms	4.1.1		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6]
4.2 Explain the difference between findings, conclusions, and recommendations	4.2.1	Review a report of experimental research and identify the findings, conclusions, and recommendations	Foundation	Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]
	4.2.2	Note the treatment of data, including tables and graphs, in a research report			Presents answers/conclusions in a clear and understandable form [1.6.13]
	4.2.3	Explain why a report must stay within the findings of an experiment and not go beyond what was observed			Exhibits enthusiasm in approaching and completing tasks [3.4.3] Sets high standards for self in completion of a task [3.4.9]
4.3 Discuss the components and preparation of a research report	4.3.1	Identify the major parts of a research report	Foundation	Writing	Records data [1.6.16]
	4.3.2	Prepare a research paper on the experiment from Unit 3			Summarizes written information [1.6.17]
	4.3.3	Produce a professionally-appearing report using computer word processing			Writes appropriate entries [1.6.22]
	4.3.4	Bind the report to have a professional document	Thinking	Seeing Things in the Mind's Eye	Imagines the flow of work activities from narrative descriptions [4.6.1] Visualizes a finished product [4.6.4]

Unit 5: Genetics and Heritability

9 Hours

Terminology: allele, chromosome, DNA, dominant, gamete, gene, genetics, genotype, heterozygous, homozygous, phenotype, recessive

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application		Skill Group	Skill	Description
5.1 Define terms	5.1.1		Foundation	Reading	Applies/Understands technical words that pertain to the subject [1.3.6] Identifies relevant details, facts, and specifications [1.3.16]
			Thinking	Reasoning	Extracts rules or principles from written information [4.5.4]
5.2 Discuss the use and importance of genetics, particularly molecular and Mendelian genetics	5.2.1	Discuss Mendel's role in the study of genetics	Foundation	Reading	Applies/Understands technical words that pertain to the subject [1.3.6]
	5.2.2	Observe the phenotype of animals for similarities and differences			Identifies relevant details, facts, and specifications [1.3.16]
	5.2.3	Elaborate on phenotype of siblings, such as puppy litter mates	Thinking	Reasoning	Extracts rules or principles from written information [4.5.4]
	5.2.4	Explain the difference between genotype and phenotype and homozygous and heterozygous			
5.3 Discuss the transmission of characteristics of animals from one generation to the next	5.3.1	Create a model of DNA	Foundation	Science	Applies scientific principles related to animal genetics [1.4.5]
	5.3.2	Relate the role of sexual reproduction in genetic transmission			Describes/Explains scientific principles related to heredity [1.4.13]
	5.3.3	Identify factors in the selection of breeding animals for producers to gain desired animal products			Constructs model to depict basic concept of DNA [1.4.11]
			Thinking	Knowing How to Learn	Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3] Processes new information as related to workplace [4.3.5]
5.4 Analyze the genotypic and phenotypic ratio	5.4.1	Use a Punnett Square for F ₁ and F ₂ crosses	Foundation	Arithmetic/ Mathematics	Applies a mathematical formula to solve a problem [1.1.3] Calculates percentages, ratios, proportions, decimals, and common fractions [1.1.10]

		Thinking	Problem Solving	<p>Constructs graphs/tables/charts [1.1.16]</p> <p>Comprehends ideas and concepts related to genetics [4.4.1]</p> <p>Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]</p> <p>Tracks and evaluates results [4.4.10]</p>
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5.5	Explain how genetic principles are used to improve animal productivity	5.5.1	Visit a crossbred cattle herd and observe improvements resulting from breeding program	Foundation	Listening	Comprehends ideas and concepts related to animal production [1.2.1]
		5.5.2	Investigate the role of genetics and breeding in companion animals	Thinking	Reasoning	<p>Listens for content [1.2.3]</p> <p>Listens to follow directions [1.2.6]</p> <p>Applies rules and principles to a new situation [4.5.1]</p> <p>Sees relationship between two or more ideas, objects, or situations [4.5.5]</p> <p>Uses logic to draw conclusions from available information [4.5.6]</p>

Unit 6: Animal Reproduction

12 Hours

Terminology: copulation, corpus luteum, embryo transfer, estrogen, estrous cycle, estrus, follicle, follicle stimulating hormone, gestation, hormone, hybridization, inbreeding, ovulation, oxytocin, parturition, progesterone, selective breeding, super ovulation, testosterone, zygote

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.1 Define terms	6.1.1	Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Uses written resources (books, dictionaries, directories) to obtain information [1.3.23]
		Thinking	Knowing how to learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
6.2 Discuss the sexual reproduction processes of agricultural animals	6.2.1 Compare reproduction processes of selected agricultural animals including mammals, birds, and fish	Foundation	Reading	Comprehends written information for main ideas [1.3.7]
	6.2.2 Relate roles of animal producers in gaining reproductive efficiency		Science	Applies scientific principles related to animal reproduction [1.4.5]
6.3 Describe the male and female reproductive systems and functions of each	6.3.1 Label the parts of the male and female reproductive tracts	Foundation	Reading	Applies/Understands technical words that pertain to the subject [1.3.6] Determines what information is needed [1.3.10]
	6.3.2 Describe the functions of the male and female reproductive systems	Personal Management	Responsibility	Interprets drawings to obtain factual information [1.3.17]
	6.3.3 Identify male and female sex cells in the reproduction process			Maintains a high level of concentration in completion of a task [3.4.7] Pays close attention to details [3.4.8] Sets high standards for self in completion of a task [3.4.9]
	6.3.4 Relate reproductive failure to disease and other conditions of the reproductive systems	Thinking	Seeing Things in the Mind's Eye	Visualizes a system's operation from schematics [4.6.3]

6.4	Discuss the estrous cycle and how the cycle influences the reproduction process	6.4.1	Prepare a circular schematic drawing of the periods in the estrous cycle of a cow	Foundation	Science	Acquires and processes scientific data [1.4.1]
		6.4.2	Explain the processes that are occurring during each period of the estrous cycle			Describes/Explains scientific data related to the estrus cycle [1.4.14]
		6.4.3	Identify the time in the estrous cycle when mating or artificial insemination should occur	Thinking	Creative Thinking	Develops visual aids to create audience interest [4.1.4] Makes connections between seemingly unrelated ideas [4.1.6]
6.5	Explain egg fertilization and cell division	6.5.1	Prepare a short written report on fertilization and cell division	Foundation	Science	Describes/Explains scientific principles related to cell division [1.4.14]
				Thinking	Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]
					Seeing Things in the Mind's Eye	Organizes and processes images—symbols, pictures, graphs, objects, etc. [4.6.2.] Visualizes a system's operation from schematics [4.6.3]
6.6	Explain the processes of superovulation and embryo transfer	6.6.1	Identify the benefits of superovulation and embryo transfer	Foundation	Reading	Applies information and concepts derived from printed materials [1.3.3]
		6.6.2	Investigate issues associated with using these reproductive technologies			Applies information to new situations [1.3.5]
		6.6.3	Observe the processes involved with superovulation and embryo transfer			Comprehends written specifications and applies them to a task [1.3.9] Interprets drawings to obtain factual information [1.3.17]
				Thinking	Creative Thinking	Finds new ways of dealing with existing problems/situations [4.1.5] Makes connections between seemingly unrelated ideas [4.1.6]

6.7	Discuss the use and importance of artificial insemination	6.7.1	List the steps in the process of artificial insemination	Foundation	Science	Applies scientific principles related to artificial insemination [1.4.5]
		6.7.2	Identify the equipment used in artificial insemination			Applies a scientific principle to solve a problem [1.4.8]
		6.7.3	Simulate the process of artificial insemination using the reproductive tract of a cow or simulator			Solves practical problems using scientific methods and techniques [1.4.23]
		6.7.4	Identify sources of semen for cattle, hogs, and other species commonly artificially inseminated	Thinking	Knowing How to Learn	Uses available resources to acquire new skills or improve skills [4.3.4] Uses available resources to apply new skills [4.3.6]
6.8	Discuss the use effects of inbreeding, crossbreeding, and pure breeding	6.8.1	Identify examples of breeding methods as practiced with agricultural animals in the local community	Foundation	Science	Applies scientific principles related to heredity [1.4.5] Applies a scientific principles to solve a problem [1.4.8] Solves practical problems using scientific methods and techniques [1.4.23]

Unit 7: Digestion and Nutrition

10 Hours

Terminology: anthelmintic, antimicrobial, carbohydrates, cud, finishing, lactation, lipids, maintenance ration, mineral, monogastric, nonruminant, nutrient, protein, ration, regurgitation, ruminant, rumination, vitamin

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application		Skill Group	Skill	Description
7.1 Define terms	7.1.1		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Thinking	Knowing How to Learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
7.2 Describe the six nutrients and their functions	7.2.1 Relate nutrient needs to the age and life condition of animals		Foundation	Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6] Summarizes written information [1.6.17]
	7.2.2 List health and production issues associated with nutrient deficiencies		Thinking	Knowing How to Learn	Uses words appropriately [1.6.21] Develops personal learning strategies—note-taking, clustering related items, flash cards, etc. [4.3.2]
7.3 Identify agricultural animal species as either ruminants or nonruminants	7.3.1 Inspect ruminant and non-ruminant digestive tracts obtained from a biological supply house or other source and prepare a report on the differences that are observed		Foundation	Science	Applies knowledge to complete a practical task [1.4.3] Performs experiment as specified [1.4.20] Records data related to differences in digestive tracts [1.4.22]
			Thinking	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]

		Reasoning	Comprehends ideas and concepts related to animal digestion [4.5.2]
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7.4	Label and describe the functions of the parts of ruminant and nonruminant digestive system	7.4.1	Label diagrams of ruminant and non ruminant digestive systems	Foundation	Reading	Applies/Understands technical words that pertain to the subject [1.3.6] Determines what information is needed [1.3.10] Interprets drawings to obtain factual information [1.3.17]
				Personal Management	Science Responsibility	Follows safety guidelines [1.4.15] Maintains a high level of concentration in completion of a task [3.4.7] Pays close attention to details [3.4.8] Sets high standards for self in completion of a task [3.4.9]
				Thinking	Seeing Things in the Mind's Eye	Visualizes a systems operation from schematics [4.6.3]
7.5	Discuss the advantages and disadvantages of feed additives such as antimicrobials, hormones, and anthelmintics	7.5.1	Investigate the use of feed additives and prepare an oral report on your findings	Foundation	Reading	Applies/Understands technical words that pertain to the subject [1.3.6] Draws conclusions from what is read [1.3.12]
					Speaking	Asks questions to clarify information [1.5.3] Asks questions to obtain information [1.5.4]
				Thinking	Decision Making	Considers risks when making a decision [4.2.3]
7.6	Design a balanced feed ration	7.6.1	Use the Pearson Square method to balance a feed ration	Foundation	Arithmetic/ Mathematics	Calculates different units of measure [1.1.6] Calculates percentages, ratios, proportions, decimals, and common fractions [1.1.10]
		7.6.2	Observe the label and assess the nutrients provided by a manufactured feed in terms meeting the nutrient needs of an animal			Enters figures/calculations from one form or chart to another [1.1.221] Uses calculator to solve mathematical problems [1.1.36]
		7.6.3	Relate the need for feeding supplements to cattle or pasture		Reading	Uses graphs/tables/charts to obtain factual information [1.3.21]

			Science	Uses standard occupational resource materials [1.3.22] Applies knowledge to complete a practical task [1.4.3]
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Unit 8: Animal Health

12 Hours

Terminology: active immunity, antibiotic, bacteria, colostrum, disinfectant, infectious disease, intradermal, intramammary, intramuscular, intrarumenally, intravenous, isolation, mastitis, noninfectious disease, oral, passive immunity, pathogen, protozoa, sanitation, stress, subcutaneous, topical, vaccine, virus

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
8.1 Define terms	8.1.1	Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		Thinking	Knowing How to Learn	Develops personal learning strategies—note taking, clustering, related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
8.2 Identify temperature, respiration rate, and heart rate as the vitals signs that indicate an animals health status	8.2.1 Take the vital signs of an animal and compare your observations to normal signs 8.2.2 Relate abnormal observations to possible health issues	Foundation	Reading	Determines what information is needed [1.3.10] Draws conclusions from what is read [1.3.12]
			Arithmetic/ Mathematics	Calculates measures taken from measuring devices [1.1.9]
			Science	Reads measurements from common measuring devices [1.4.20]
		Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1] Comprehends ideas and concepts related to animal health [4.5.2]

8.3	Describe and compare the different pathogens and parasites that cause diseases in animals	8.3.1	Observe specimens of parasites commonly found in agricultural animals	Foundation	Science	Applies a scientific principle to solve a problem [1.4.8]
		8.3.2	List animal production practices to minimize risk of parasite infestations	Thinking	Know How to Learn Reasoning	Develops personal learning strategies—note taking, clustering related items, flashcards, etc. [4.3.2] Sees relationship between two or more ideas, objects, or situations [4.5.5]
8.4	Describe environmental factors that affect animal health such as sanitation and stress	8.4.1	Observe animal facilities to identify environmental factors that may lead to disease	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
		8.4.2	Identify sanitation practices that can be used to protect animals, including the prevention of terrorism	Thinking	Problem Solving	Demonstrates logical reasoning in reaching a conclusion [4.4.2]
8.5	Describe how diseases and illnesses are prevented and animal well-being is promoted	8.5.1	Prepare an oral report on the well-being requirements of a selected agricultural animal	Foundation	Speaking	Organizes ideas and communicates oral messages to listeners [1.5.7]
		8.5.2	List animal production practices that promote well-being		Writing	Applies/Uses technical words and concepts [1.6.4] Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6] Evaluates written information for appropriateness/content/clarity [1.6.9]
8.6	Identify types of injections	8.6.1	Practice filling a syringe and making injections using an orange and a clean hypodermic needle with syringe	Foundation Personal Management	Science Responsibility	Follows safety guidelines [1.4.16]
		8.6.2	Determine locations of injections on selected animal species			Observes health code/sanitation requirements [1.4.19] Exhibits enthusiasm in approaching and completing tasks [3.4.3] Maintains a high level of concentration in completion of a task [3.4.7] Pays close attention to details [3.4.8]
8.7	Describe the types of immunity and how immunity can be improved	8.7.1	Investigate how animals develop natural immunity	Foundation	Reading	Comprehends written information for main ideas [1.3.7]
		8.7.2	Compare natural immunity with that created with biologicals			Constructs a graph of data [1.3.10] Constructs hypothesis [1.3.11]

		Thinking	Creative Thinking	Combines ideas or information in a new way [4.1.2] Makes connections between seemingly unrelated ideas [4.1.6]
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Unit 9: Biological Engineering

8 Hours

Terminology: biological engineering, biotechnology, E. coli, gene splicing, recombinant DNA, particle gun, transgenic organism

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application		Skill Group	Skill	Description
9.1 Define terms	9.1.1		Foundation	Reading	Applies information and concepts derived from printed materials [1.3.3]
9.2 Discuss the importance and potential of biotechnology in animal production	9.2.1	Explain the use and methods of gene transfer	Foundation	Listening	Comprehends ideas and concepts related to biological engineering [1.2.1]
	9.2.2	Observe the two types of gene transfer used in science applications (particle gun and bacterial insertion)		Speaking	Organizes ideas and communicates oral messages to listeners [1.5.7]
	9.2.3	Research the use of gene transfer with agricultural animals and provide an oral report			
9.3 Describe genetic engineering in the biological animal sciences	9.3.1	Debate the advantages and disadvantages of genetic engineering	Foundation	Listening	Comprehends ideas and concepts related to biological engineering [1.2.1]
	9.3.2	Prepare a report on the role of transgenic animals in human medicine		Reading	Applies information and concepts derived from printed materials [1.3.3]
9.4 Discuss concerns associated with genetic engineering	9.4.1	Determine opinions of class members about concerns with genetic engineering	Foundation	Listening	Comprehends ideas and concepts related to biological engineering [1.2.1]
	9.4.2	Identify scientific principles in genetic engineering as related to having an informed public		Reading	Applies information and concepts derived from printed materials [1.3.3]

Unit 10: Animal Product Food Preservation

10 Hours

Terminology: aerobic bacteria, anaerobic bacteria, California mastitis test, canning, casein, cheese, coliform bacteria, curd, curing, dehydration, fermentation, irradiation, microbes, mold, nonfat solids, paraffin, pasteurization, penicillium, perishable, pickling, putrefaction, raw milk, refrigeration, rennet, salmonella, salting, somatic cell count, whey, yeast, yogurt

CAREER AND TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
10.1 Define terms	10.1.1	Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		Thinking	Knowing How to Learn	Develops personal learning strategies—note taking, clustering, related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
10.2 Describe the role of preservation in preventing food spoilage	10.2.1 Identify how microbes, chemicals, and other substances cause food spoilage	Foundation	Reading	Understands technical words that apply to the subject [1.3.6]
	10.2.2 Create a list of the ways animal products are preserved and identify products preserved by each in such ways		Science	Applies scientific principles related to food spoilage [1.4.5]
	10.2.3 Observe a food preservation or processing plant and prepare a report on your observations	Thinking	Reasoning	Observes health codes/sanitation requirements [1.4.8] See relationship between two or more ideas, objects, or situations [4.5.5]

10.3	Describe methods of food preservation	10.3.1	Give an oral report on ways food items in a grocery have been preserved	Foundation	Reading	Comprehends written information for main ideas [1.3.7]
		10.3.2	Make beef jerky using a food dehydrator	Personal Management	Science Speaking Responsibility	Follows safety guidelines [1.4.16] Applies knowledge to complete a practical task [1.5.3] Exhibits enthusiasm in approaching and completing tasks [3.4.3] Exerts a high level of effort and perseverance toward goal attainment [3.4.4] Pays close attention to details [3.4.8]
10.4	Describe the effects of pasteurization on bacteria in milk	10.4.1	Research the life and works of Louis Pasteur	Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		10.4.2	Explain the process of pasteurization	Thinking	Science	Describes/Explains scientific principles related to pasteurization [1.4.14] Solves practical problems using scientific methods and techniques [1.4.23]
10.5	Describe how yogurt and cheese are produced	10.4.3	Make a field trip to a dairy processing facility to observe the operation of pasteurization equipment		Problem Solving	Comprehends ideas and concepts related to pasteurization [4.4.1] Recognizes/Defines problem [4.4.8]
		10.5.1	Make yogurt	Foundation	Science	Applies knowledge to complete a practical task [1.4.3] Measures dry and liquid supplies [1.4.17] Uses equipment and techniques involved in making yogurt [1.4.24]
		10.5.2	Taste samples of different cheeses and investigate why cheeses vary in taste	Interpersonal	Teamwork	Contributes to group with ideas, suggestions, and effort [2.6.2] Works effectively with others to reach a common goal [2.6.6]

Glossary

Unit 1: Biological Sciences in Our Lives

1. animal science—the science of animals; applied zoology
2. biological science—the study of living organisms
3. zoology—the branch of biology that deals with animal life

Unit 2: Safety in Biological Animal Science

1. animal restraint—holding or confining animals so that management practices may be applied
2. laboratory accident—an accident occurring in a laboratory environment
3. occupational safety—promoting safety in the workplace
4. personal safety—promoting the protection of individuals from injury
5. safety—preventing loss or injury
6. zoonosis—a disease communicable from animals to humans under natural conditions; also known as zoonotic disease

Unit 3: Conducting and Reporting Experiments

1. conclusion—a specific statement about the relationship between variables
2. control group—in a scientific experiment, a group of animals, plants, etc., that do not receive the treatment under study
3. data—factual information; information in numerical form
4. dependent variable—the variable that is measured to determine the effects of the independent variable
5. experiment—a set of procedures used to gather information
6. findings—actual data generated from an experiment
7. hypothesis—a tentatively accepted theory that explains the relationship between two variables
8. independent variable—the variable in an experiment that is manipulated
9. manipulation—management of the independent variable in an experiment
10. procedure—a detailed and complete description of how the experiment is or was conducted
11. recommendation—suggestions on how results should be used; suggestions for further experimentation
12. replication—exact duplication of an experiment
13. research—investigation or experimentation aimed at the discovery and interpretation of facts
14. treatment—the manipulation of an independent variable

Unit 4: Summarizing and Reporting Research

1. abstract—a summary or short version of a piece of writing
2. background—information that reveals key knowledge about an item or theory that can be used to support ideas or give guidance for further investigation
3. bibliography—a list of references presented in a manner that the sources can be found again for verification or further studies
4. conclusion—specific statements about the relationships between variables
5. finding—actual data generated from an experiment
6. hypothesis—a tentatively accepted theory that explains the relationship between two variables
7. procedure—method of carrying out an experiment so it can be replicated again by other individuals
8. recommendation—a suggestion on how results should be used or for further experimentation

Unit 5: Genetics and Heritability

1. allele—matching genes on homologous chromosomes
2. chromosome—that part of a cell that contains information about genetic makeup and transmits that information to offspring
3. DNA—deoxyribonucleic acid; forms the basic material in the chromosomes of the cell nucleus
4. dominant—relating to one of a pair of allelic hereditary factors that dominates the other and appears in the organism
5. gamete—the sex cell; either an egg or a sperm
6. gene—a unit of inheritance that is composed of DNA
7. genetics—the study of heredity in plants and animals
8. genotype—the genetic makeup of an organism; allele composition
9. heterozygous—having different alleles for a single trait, and, therefore, producing two or more different kinds of gametes
10. homozygous—having identical alleles at one or more loci, and, therefore, producing identical gametes
11. phenotype—the physical appearance of an organism
12. recessive—an allele that is not expressed phenotypically when present in the heterozygous condition

Unit 6: Animal Reproduction

1. copulation—the mating of a male and female
2. corpus luteum—a reddish-yellow mass that forms in a ruptured follicle in the ovary of mammals; the hormone progesterone is released by the corpus luteum
3. embryo transfer—moving an embryo from one female animal to another of the same species
4. estrogen—a hormone produced by the ovaries
5. estrous cycle—the time between periods of estrus
6. estrus—the time during which the female will accept the male for copulation; also referred to as being “in heat”
7. follicle—a small blister-like development on the surface of the ovary that contains the developing ovum
8. follicle stimulating hormone—a hormone produced by the pituitary gland that promotes growth of ovarian follicles in the female and sperm in the male
9. gestation—the time during which the animal is pregnant
10. hormone—an organic material given off by a body gland that helps to regulate body functions
11. hybridization—the production of hybrids by natural crossing or by manipulated crossing
12. inbreeding—the mating of closely related animals
13. ovulation—the release of the egg from the ovary
14. oxytocin—a hormone that causes contractions of the uterus during breeding and parturition and causes milk letdown
15. parturition—the act of giving birth
16. progesterone—a hormone produced by the ovaries that maintains pregnancy in the animal
17. selective breeding—the breeding of selected animals chosen because of certain desirable qualities or fitness
18. super ovulation—the stimulation of more than the usual number of ovulations during a single estrous cycle due to the injection of certain hormones
19. testosterone—a male hormone that controls the traits of the male animal
20. zygote—a cell formed by the union of two gametes

Unit 7: Digestion and Nutrition

1. anthelmintic—a chemical compound used for treating internal worms in animals
2. antimicrobial—a substance that can destroy or inhibit the growth of microorganisms
3. carbohydrates—organic compounds containing carbon, hydrogen, and oxygen
4. cud—in ruminants, a ball-like mass of feed that is brought up from the stomach to be re-chewed
5. finishing—the increased feeding of an animal just prior to butchering that results in rapid gains and increased carcass quality
6. lactation—the period of milk secretion
7. lipids—fats and oils made up of carbon, hydrogen, and oxygen
8. maintenance ration—the amount of feed needed to support an animal when it is not doing work, yielding no product, and gaining no weight
9. mineral—an inorganic substance needed in small amount for proper nutrition
10. monogastric—refers to an animal that only has one stomach or stomach compartment
11. nonruminant—an animal that has a simple, one-compartment stomach
12. nutrient—a chemical element or compound that aids in the support of life
13. protein—an organic compound made up of amino acids and containing carbon, hydrogen, and nitrogen
14. ration—the total amount of feed that an animal is allowed during a 24-hour period
15. regurgitation—to return undigested food from the stomach to the mouth as with ruminants
16. ruminant—an animal that has a stomach divided into several compartments
17. rumination—the process of digestion in cattle whereby food is swallowed to the first stomach (the rumen) and then regurgitated into the mouth and chewed over again to be swallowed for further processing by the second, third, and fourth stomachs
18. vitamin—an organic compound needed in small amounts for nutrition

Unit 8: Animal Health

1. active immunity—the type of immunity in an animal that is permanent
2. antibiotic—a chemical agent that prevents the growth of a germ or bacteria
3. bacteria—one-celled microorganisms; many species
4. colostrum—the milk produced the first few days after parturition
5. disinfectant—a chemical that destroys microbes by breaking down cell proteins
6. infectious disease—a disease that is contagious; a disease that is transmitted from one animal to another
7. intradermal—injections placed in the skin tissue
8. intramammary—injections placed in the mammary glands
9. intramuscular—injections placed in the muscle tissue
10. intrarumenally—injections placed in the rumen
11. intravenous—injections placed in the vein
12. isolation—confining an animal away from other animals to prevent breeding or spread of disease
13. mastitis—an inflammation of the mammary gland that is usually associated with infection
14. noninfectious disease—a disease that cannot be transmitted from one animal to another
15. oral—taken by mouth
16. passive immunity—immunity that is temporary
17. pathogen—a living, microscopic, disease-producing agent, such as a bacterium or a virus
18. protozoa—a one-celled animal
19. sanitation—the development and practical application of measures designed to maintain or restore healthful conditions
20. stress—a strain, or straining condition, that may be physical, chemical, or psychological and cannot be adjusted to satisfactorily
21. subcutaneous—an injection placed just under the skin but above muscle tissue
22. topical—medicine that is applied to the surface of the skin
23. vaccine—a substance that contains live, modified, or dead organisms or their products that is injected into an animal in an attempt to protect the host from disease caused by that particular organism
24. virus—a self-reproducing agent that is considerably smaller than a bacterium and can multiple only within the living cells of a suitable host

Unit 9: Biological Engineering

1. biological engineering—an advanced form of biotechnology; techniques involve gene splicing, replication, and transfer of genes to other organisms
2. biotechnology—the management of biological systems for the benefit of humanity
3. *E. coli*—bacteria that are commonly used to deliver new or altered genetic material in an organism; normally inhabit human colon
4. gene splicing—the process of adding new genetic material within the DNA sequence of an organism
5. particle gun—a device used to insert new genetic material into an organism

Unit 10: Animal Product Food Preservation

1. aerobic bacteria—organisms that grow only in the presence of oxygen
2. anaerobic bacteria—organisms that grow without the presence of oxygen
3. California Mastitis Test (CMT)—a field test that estimates the extent of mastitis infection
4. canning—placing food in a container and heating it to kill all microorganisms
5. casein—a phosphoprotein that is one of the main components of milk and the basis of cheese
6. cheese—a food product made from the solids in milk
7. coliform bacteria—a group of bacteria that usually inhabits the intestines of animals and lives in manure and on wood
8. curd—an acid buildup created by bacteria, consisting mostly of casein and obtained from soured milk through coagulation
9. curing—adding substances to food to prevent spoilage; salting, smoking, pickling, etc.
10. dehydration—the removal of 95 percent or more of the water from any substance by exposure to high temperature
11. fermentation—the processing of food by the use of selected yeasts, molds, or bacteria
12. irradiation—the process of treating of a food or feed with ultraviolet light to increase the Vitamin D content
13. microbes—minute plant and animal life; some cause disease; others are beneficial
14. mold—fungi distinguished by the formation of a network of filaments or thread or by spore masses
15. nonfat solids—the parts of a substance, not including the fat, that help it keep its form
16. paraffin—a thin layer of waxy material that helps seal the surface of a fruit to prevent damage to the skin
17. pasteurization—the process of heat-treating milk to kill microbes
18. penicillium—any of a genus of imperfect fungi growing as green mold on stale bread, ripening cheese, or decaying fruit
19. perishable—any product that is easily or quickly destroyed or made unusable or unsafe
20. pickling—a process of food preservation that uses a solution, such as vinegar, that is too acidic for microbes to grow
21. putrefaction—decomposition of animal or plant matter by microorganisms in the absence of oxygen
22. raw milk—untreated milk as it comes from the cow; fresh milk
23. refrigeration—artificial cooling that drastically reduces microbial growth of certain bacteria
24. rennet—a coagulating extract containing the enzyme rennin; used to curdle milk, as when making cheese
25. salmonella—a large group of bacteria, some of which cause food poisoning

- 26. salting—a method of preserving food that uses salt to prevent the growth of microbes
- 27. somatic cell count—a laboratory test that indicates the presence and severity of mastitis
- 28. whey—the watery liquid that is separated from the curd after milk coagulation
- 29. yeast—a yellowish substance composed of microscopic, unicellular fungi that induces fermentation in juice, dough, and other materials
- 30. yogurt—a semisolid, fermented milk product